IN THE SPECIFICATION

Page 4, lines 4 to 19, replace the paragraph with the following amended paragraph.

Figure 1b and Figure 2 show an example arrangement in a sensor according to the present invention. A coil 1 receives RF current 4 via a multiply resonant transmission line 6. The electromagnetic field 5 produced by the coil 1 drives a piezoelectric element 3 to produce acoustic waves by electrostriction. The sensing done by the acoustic waves occurs either directly or indirectly. The substance to be detected either adsorbs to the vibrating surface, or a receptor can be attached to the vibrating surface, which is specific to the substance to be detected. When the substance adsorbs, it changes the acoustic spectrum. The coil 1 also acts as a detector[,] which converts the changed electromagnetic field caused by the changed acoustic waves back into a RF current which is detected by a detection circuit, which includes an AM-diode detector 7 in this example.

Page 6, lines 1-10, replace the paragraph with the following amended paragraph.

The present invention is the result of optimising the electrical configuration so coupling between the dipoles instigated in an electromagnetic source such the spiral coil 1 and ~~diploes~~dipoles in a material element lead to wideband ultrasonic and hypersonic evanescent

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wave generation. We have determined that the electrical circuit components are very important in enabling or restricting the flow of RF current to the coil, so fluctuations in the magnitude of these currents due to the acoustic generation process can be measured.

Page 8, lines 5 to page 9, line 17, replace the paragraphs with the following amended paragraphs.

As shown in Figure 1, the spiral coil 1 is used to induce an RF electrical field 5 in a piezoelectric plate 3, and can be described by an equivalent circuit of impedance Z_R

$$Z_R = \left(j\omega c + \frac{1}{R_L + j\omega l} + \frac{1}{R_p} \right)^{-1}$$

comprising a capacitor (1.7 pF), inductor (1.15 uH) a wire, resistance (5 Ohm) and parallel resistance (8000 Ohm) as indicated in Figure 2. For a 30 turn coil made from 0.085 mm enamelled copper wire, a precise fit between the calculated and experimental response, determined via the HP impedance analyser (4291B), can be obtained. A comparison with an electroded TSM 6.5 MHz device indicates the large difference in impedance between capacitive and inductively coupled crystals, indicating that electrical conditions for acoustic detection will necessarily be different in these two cases. One key difference understood from the equivalent circuits[7] is that the coil exhibits a parallel electrical resonance (matching

resonance), even when no capacitance is directly attached to the coil. This behaviour is [a] due to inter winding and substrate capacitance, which may shunt valuable current away from driving of the acoustic resonance and contribute to dielectric losses at hypersonic frequencies. However, as quick recovery of data over a wide bandwidth is desirable, time consuming manual tuning of the electrical characteristic is avoided by using a multiply resonant coaxial transmission line, 6, or other electrical coupling means, between the coil and detector.

Because of its repeating electrical impedance, the coaxial line 6 transfers RF current over a wide bandwidth without [a] deleterious matching losses. For this reason, it effectively replaces the capacitor used with the original MARS system, which acts as a current shunt at high frequency. The impedance of the transmission line 6 can be calculated from Z.

$$Z = Z_0 \left[\frac{(Z_R / Z_0) + Tanh[yd]}{1 + (Z_R / Z_0)Tanh[yd]} \right]$$

where $\gamma = \sqrt{(R + j\omega l)(G + j\omega C)}$ and $Z_0 = \sqrt{(R + j\omega L)/(G + j\omega C)}$,

and d is the length of the line 6 and shown to fit our experimental data

when R=0.1 ohm, L=O.23uH, C=55pF and G=10^{-9}. Its repeat behaviour

is. due to the electromagnetic standing wave condition in the line, which

leads to multiple resonances similar to acoustic resonance, however, the

lower electrical Q factor leads to impedance fluctuations of the line

staying within a specified range. This prevents severely mis-matched

electrical conditions from arising, whilst retaining simplicity without the

need for manual tuning. These coaxial line resonances therefore assist

acoustic detection at [a]very high frequencies.

Page 9, line 32 to page 10, line 17, replace the paragraph with the

following amended paragraph.

The basis to acoustic generation is the electrical current following

through the coil and the transmission line and its interaction with the

magnetic or electric dipoles in the disk. Here, current driven through the

electrical network to the coil 1[7] leads to a varying magnetic field

(Ampere's law) and in turn and electrical field 5 (Faraday's law) which

forces dipoles into motion. In the example presented here, this process is

the dipoles in the piezoelectric disc 3 being driven by an electric field via

electrostriction, effectively a change in dimension of the disc within the

field. For acoustic generation across many frequencies, the following

conditions must be satisfied: (1) sufficient current must be available in

the windings of the spiral coil (2) the resulting electrical fields must be

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predominantly perpendicular to the plane of the disk (AT piezoelectric crystal only) (3) the acoustic loss needs to be minimal. Placing energy in the acoustic spectrum is critically dependent on the coil construction, and the highest frequency of generation desired.